

Name	Basic Branch	Name	Basic Branch
Smith, Sean M.	QM	Wiedenman, Nathan	AR
Taylor, Jack S.	AG	Williams, Leon O.	QM
Tolbert, Vincent J.	FA	Williams, Robert M.	MI
Trimble, William Jr.	IN	Williams, Xaviera C.	SC
Turner, Duane A. Jr.	AR	Willoughby, Paul W.	SC
Walsh, Joshua F.	FA	Wood, Camilla A.	SC
Weizer, Paul I.	AV	Yankovich, Michael F.	EN
Wernau, John J.	SC	Yu, Victor Y.	AR
White, Jeffrey R.	FA	Zopelis, James E.	AD

News Briefs

Lean Savings Returned to Letterkenny Army Depot



COL William A. Guinn, LEAD Commander, presents a ceremonial check for \$990,000 to LTG Philip R. Kensinger Jr., SOCOM Commanding General, during a ceremony at Letterkenny Army Depot.

Savings realized by Letterkenny Army Depot (LEAD), Chambersburg, PA, through the application of lean principles on the Special Operations Forces (SOF) Ground Mobility Vehicle (GMV) modification program were returned during a ceremony Feb. 17, 2004, at Fort Bragg, NC. COL William A. Guinn, LEAD Commander, presented a ceremonial check for \$990,000 to LTG Philip R. Kensinger Jr., Commanding General, U.S. Army Special Operations Command (SOCOM).

Letterkenny and SOF have been working jointly to modify special purpose high-mobility multipurpose wheeled vehicles that are transformed into the new fighting platforms called GMVs.

SOF teams include Army Rangers, Army Special Forces Groups and U.S. Navy SEAL (sea, air, land) teams. Each team's vehicles are tailored to meet various operational scenarios and tempos. CPT John Anderson, 3rd Special Forces, offered his opinion on GMVs: "Our unit likes the modifications that LEAD has performed on the GMVs and, what's more important, their performance in the field. They take us anywhere now."

Depending on the service requirement, modifications included auxiliary fuel tank installation to achieve longer distances, multi-position gun mounts, grenade launchers and electronic rack mounting for communications augmentation as well as additional ammunition and missile stowage for these vehicles, which are used in Southwest Asia and other locations around the globe.

Lean manufacturing is a strategy geared toward identifying and eliminating waste in a process. Lean manufacturing techniques save money by producing lower costs, higher quality and shorter lead times. Using lean practices, Letterkenny employees streamlined the SOF GMV production line, and Guinn passed these savings back to the customer — SOCOM. Kensinger praised the LEAD workers for their prompt response to his command's needs. "Our confidence in Letterkenny is well-placed and we are proud to work with you in this effort," Kensinger said.

In presenting the ceremonial check, Guinn said, "It isn't often that a depot actually returns savings achieved through efficiencies. Indeed, as far as I know this is only the second time. Letterkenny was also the first to do so when we returned more than \$1 million in lean savings from our PATRIOT program." Guinn concluded, "The implementation of lean principles is enabling LEAD to be the depot of choice for the SOF Group."

Maintenance Support Device Standardizes Army Test Equipment

Thuan Khong

In March 2003, Product Manager for Test, Measurement and Diagnostic Equipment (PM TMDE), in coordination with the Program Executive Officer (PEO) for Aviation; Project Manager for Aviation Systems; PM for Aviation Mission Equipment; and Miltope Corp., the Maintenance Support Device (MSD) prime contractor, kicked off an engineering change proposal effort to include the latest commercial technologies and capabilities in the MSD upgrades.



In support of *Operation Iraqi Freedom* the 155mm howitzer sends flames into the air as it fires. U.S. Marine Corps photo by Lance Cpl. Matthew J. Decker, 15th Marine Expeditionary Unit.

These upgrades included:

- Pentium III 700 megahertz to Pentium Mobile (M) 1.3 gigahertz processor.
- 256 megabyte (MB) to 512 MB Synchronous Dynamic Random Access Memory (SDRAM).
- 8 MB to 64 MB video RAM, nonamplified to amplified audio output.
- Embedded RS-485 interface.

Upgrades resulted directly from additional requirements of MSD customers and users — Aviation Mission Planning Systems (AMPS), Stryker Brigade Combat Teams (SBCTs) and PATRIOT.

In September 2003, PM TMDE fielded the upgraded MSD to support the SBCT at Fort Lewis, WA, and Fort Wainwright, AK; AMPS fielding; homeland defense and other DOD weapon systems. This marked the first time that PM TMDE fielded a product to Soldiers at the same time it was introduced to the commercial market.

The Integrated Family of Test Equipment's MSD is managed by PM TMDE (at Redstone Arsenal, AL) under the PEO for Combat Support and Combat Service Support (PEO CS&CSS). MSD is the third generation multipurpose Army Standard Automatic Test Equipment (ATE) used throughout DOD at all maintenance levels to test and diagnose complex electronics, engines, transmissions, central tire inflation systems and antilock brake systems in missile, aviation and vehicular weapon systems.

MSD supports Army transformation by significantly increasing higher readiness rates, supportability and sustainability of deployed forces, while simultaneously standardizing electronic and

vehicular test capability, increasing unit deployability and reducing the force's logistics footprint. Without MSD, weapon systems maintainers would be forced to revert back to multimeters, oscilloscopes and paper instructional manuals. Any step backward directly impacts unit readiness, supportability and sustainability. Without MSDs, units will require more spare parts because of higher no-evidence-of-failure (NEOF) rates. This further burdens the supply system and ties up critical transportation assets. Lack of MSDs will result in longer repair cycle times because it will take longer to diagnose faults and more time will be spent waiting for parts that are actually not needed because of NEOF.

Weapon system maintainers use the MSD to execute system Interactive Electronics Technical Manuals/Electronics Technical Manuals and/or specific application software to troubleshoot the weapon systems quickly and reliably. The MSD is a ruggedized, self-contained, man-portable system that is also being used widely for command, control, communications, computers and intelligence applications such as high-frequency tracker and AMPS, and to upload/download mission data or software. This general-purpose TMDE has been in production since summer 2002 with more than 4,500 systems fielded to the Army, homeland defense, National Guard, Air Force and Navy facilities in CONUS and OCONUS in support of many current and future weapon systems. MSD enables the Army to standardize its electronic and vehicular test capability, eliminate proliferation of TMDE and reduce weapon system logistics costs.

MSD, like its predecessors, is a hardened laptop configuration tester with a Microsoft® Windows operating system, 13.3-inch



Soldiers launch a PATRIOT missile during an exercise. U.S. Air Force photo by TSGT James D. Mossman.

Sunlight Readable Milbrite display, a Pentium M processor and personal computer cards for connectivity (Digital Multimeter, IEEE-488, MIL-STD-1553 bus, etc.). MSD interfaces also include:

- Two RS-232/485 ports
- Two USB ports
- IEEE 1284 parallel port
- IrDA compliant infrared port
- SVGA port
- Internal 56K modem
- Internal 10/100Base T Ethernet

For vehicular test and diagnostic requirements, the MSD also includes the Internal Combustion Engine (ICE) kit. The ICE kit allows mechanics to diagnose engines, transmissions, central tire inflation systems and antilock brake systems through the J1939, CAN, J1708, J1850, GM-UART and Haldex data buses. On the analog-dependent platforms, ICE box, digital multimeter and various cables and fittings are used to diagnose faults by measuring direct current or alternating current voltage, amperage, resistance, pressure and frequency.

As the Army standard, the MSD — or its successor — will be the platform tester for Future Force combat repair teams. PM TMDE is continually looking at customer needs and industry solutions to make the most modern ATE capability available to Soldiers and weapon maintainers.

THUAN KHONG is an Assistant Product Manager for At Platform Automatic Test Systems, PEO CS&CSS, Project Manager for Measurement, Electric Power and Protection and PM TMDE. To continue the MSD discussion, contact the author at DSN 788-8591 or via e-mail at thuan.khong@us.army.mil.

Killion Named DASA(R&T)

Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT) Claude M. Bolton Jr. recently announced the appointment of Dr. Thomas H. Killion as the Deputy Assistant Secretary of the Army for Research and Technology (DASA(R&T)) and Chief Scientist. Killion has served in the ASAALT Office as the Acting DASA(R&T) since Dr. A. Michael Andrews III left government service in June 2003. Prior to that, he served as the Office of the DASA(R&T) Director for Technology. Killion has also held key government



positions with the U.S. Army, U.S. Air Force and the Defense Threat Reduction Agency. A native Midwesterner, Killion received his Ph.D. in experimental psychology from the University of Oregon. He has authored several research and technology publications and articles. His background and experience bring great assets to both the ASAALT Office and the Army.

Personal Coolers Become Smaller



Two working personal cooler prototypes weighing less than 5 pounds have been developed in the latest step to downsizing the system.

Every soldier will carry some high-temperature relief when a microclimate cooling system is incorporated into the upcoming Objective Force Warrior uniform. Microclimate cooling has been researched and developed at the U.S. Army Soldier Systems Center (SSC) in Natick, MA, since the 1980s. Research began with the Portable Vapor Compression System shaped like a vacuum cleaner canister weighing 27 pounds, leading up to several compact prototype systems weighing less than 5 pounds and resembling oversized bricks.

Engineers on the Chemical Technology Team are focused on having a system that weighs less than 4 pounds by 2008 and, ultimately, a system weighing less than 3 pounds by 2015 that will still provide the desired cooling to enhance soldier safety and performance.

“Cooling is a medical and safety issue,” said Brad Laprise, a mechanical engineer at SSC. “Comfort is a by-product. You’ll never

feel like you're in an air-conditioned room [with these systems], but the idea is to mitigate the soldiers' heat stress, allowing them to do their jobs safely and more effectively."

Cooling can also be a force multiplier because troops can work longer without taking frequent breaks as a result of high ambient temperatures. Cooling also reduces the logistics load by decreasing the amount of drinking water, said Walter Teal, a chemical engineer.

Various microclimate cooling systems are now used for different needs. In 1989, sailors aboard ships started wearing vests that held ice packs slipped into front and rear horizontal pockets. Explosive Ordnance Disposal technicians and those encapsulated in outfits protecting them from toxic agent exposure use the Personal Ice Cooling System, which pumps ice-cold water from a 2-liter bottle carried by the individual through a tube-lined cooling garment. M1 tanks and Bradley infantry fighting vehicles have built-in systems that circulate filtered and conditioned air through a Natick-designed vest worn by crewmen.

The latest microclimate cooling application will benefit Army helicopter pilots beginning in 2004, Laprise said. From the initial Portable Vapor Compression System to an intermediate unit weighing about 21 pounds, a 6.6-pound system called the Advanced Lightweight Microclimate Cooling System was developed. This eventually led to the Air Warrior Microclimate Cooling System program. Built into the helicopter, the system is worn in conjunction with a new stitchless cooling garment also designed at Natick.

During testing, pilots using the cooling system could safely extend their mission from 1.6 hours to no less than 5.3 hours, according to Teal. Still, what works for pilots in their aircraft isn't desirable for a dismounted soldier. Laprise said it's impossible to have one microclimate system for every purpose.

The personal coolers designed by Aspen Systems Inc. in Marlborough, MA, and Foster-Miller in Waltham, MA, are unique prototypes using the same technology as the Advanced Lightweight Microclimate Cooling System, but in a smaller package.

"These prototypes are stepping stones. The next step is to take the lessons learned from the Aspen and Foster-Miller units and go to something smaller," Teal remarked. "We know we are pushing the envelope of vapor compression, but we think there are things we can do to lower the weight and power use."

Vapor compression technology works the same way as a refrigerator or air conditioner. Basic components include a compressor, condenser, evaporator, thermal expansion tube, fan and pump working to move heat to the ambient environment. In the case of microclimate cooling, liquid is chilled and pumped through a vest lined with a network of tubing, thereby removing excess body heat.

The Foster-Miller prototype provides 110 watts of cooling at 95 degrees F ambient temperature and weighs 4 pounds. The Aspen prototype weighs 4.65 pounds and provides 120 watts of cooling under the same conditions. Both systems require 50 watts of power, but engineers hope to achieve similar cooling capacity with only 30 watts of power in the future.

Although 300 watts of cooling is ideal, at least 100 watts of cooling is needed to lower core body temperature according to recent studies and test results, Teal said. Lower cooling capacity is a trade-off for reduced weight.

Shrinking size an inch or two and trimming a few ounces here and there will work for the next phase, but Teal said breakthrough technology is needed to achieve the most compact cooler for Objective Force Warrior. "Taking off those last 2 pounds will take more effort than the first 22 pounds," he predicted.

For more information about SSC, go to <http://www.natick.army.mil>.

TARDEC Teams to Fortify HMMWVs

Paul D. Mehney

Kicking up a cloud of dust, a convoy of high-mobility multi-purpose wheeled vehicles (HMMWVs) rolled out of Camp Anaconda, Iraq, in early November 2003 — a relatively common occurrence at Anaconda, but something was different about this convoy. Soldiers stared at the vehicles as if they had never before seen a HMMWV. "Look at the doors," was a frequent comment. Indeed, the HMMWV doors on this convoy were different — they were armor.

Responding to Soldiers' comments that standard HMMWV doors (whether cloth or metal) did not protect the driver or

Soldiers and TARDEC engineers install ASKs on HMMWVs at Camp Anaconda, Iraq.



passengers from small arms or explosive device fragment threats, designers and engineers at the Research Development and Engineering Command's (RDECOM) Tank Automotive Research, Development and Engineering Center (TARDEC) and Army Research Laboratory (ARL) swung into action to provide a technology solution to the threat.

Testing of an armor door system began at Aberdeen Test Center (ATC), Aberdeen Proving Ground (APG), MD. The original prototype design was a 2-door kit providing maximum protection and producibility by making the left and right doors interchangeable. TARDEC engineers subsequently teamed with ARL to lend their expertise in design, integration and manufacturing.

On Oct. 10, 2003, TARDEC Design and Digital Mock-up Team engineers Mike Manceor and John Edry flew to ARL to talk to the designers and look at the prototype doors they had fabricated. They were keen to learn how the design could be enhanced to address vehicle integration, producibility and operational issues. The ARL design basically consisted of a flat, square-shaped door that had been rapidly prototyped, performance-tested and quickly shipped to Iraq. Well received and much appreciated by Soldiers, the doors were soon dubbed the Armor Survivability Kit (ASK).

Concurrent with ARL's ongoing activity, TARDEC initiated a detailed door design review and evaluated all associated vehicle integration efforts. According to Manceor, "A variety of factors were addressed, including door form and fit issues, door latch assembly safety concerns and the usability of the door's reinforced windows." Without compromising ARL's survivability standards, TARDEC engineers went to work

using computer-based Pro/ENGINEER® computer-aided design (CAD) 3-D modeling to integrate form, fit and functionality issues into a redesigned door kit.

Realizing that Soldiers must quickly install the doors without any special equipment, TARDEC engineers looked at ways to fit the armor doors to the vehicle's contour. This would make the doors more functional and not compromise quick installation. Within days, TARDEC engineers had a door design that included bends matched to the HMMWV's shape — even weather strips were added to keep out environmental infiltration.

Another major concern was window usability; the initial design called for a reinforced door window. Once assembled, however, the window could only open a small amount, which prevented Soldiers from using it as a firing port. This problem was identified during ARL testing and was echoed in Soldiers' comments from the field. TARDEC designed and created a unique mechanism that allowed the reinforced window to open and lock in several positions so that it could be used as a firing port.

Additionally, a more robust door latch system that stood up to rigorous safety standards was needed. Partnering with safety engineering, TARDEC engineers designed a heavy-duty latch capable of withstanding the armor door's weight. "We used many of the parts already being used on the existing HMMWV latch, but after making sure that the latch could keep the heavy door closed during impact testing, it was discovered that we needed to revise the design slightly for an even heavier latch," Manceor commented. The result

was a safe, strong and easily installed door latch made of existing and new rapid-prototyped parts.

While addressing the major design issues, TARDEC also worked closely with the Army's Product Manager (PM) Light Tactical Vehicles to tackle the PM's concerns. Noting that there are more 4-door HMMWVs than 2-door models, engineers designed rear passenger doors, allowing the creation of 4-door kits. Soldiers in Iraq also echoed this need, commenting they often travel with more than two Soldiers to a HMMWV, so a 4-door kit was needed to protect rear passengers.

For added protection, the ASK also includes seat-back and rocker-panel protection kits. According to Jim Soltész, TARDEC Associate Director of Design and Manufacturing, "The design and fabrication of the complete door kits with the added protection panels took only 20 days. This was due to using TARDEC's computer numerically controlled lathes, vertical mills and water jet cutting systems. This technology enabled the data developed by our state-of-the-art CAD stations to migrate to the shop floor with only minor manipulation by mechanical engineering technicians."

After 1,650 miles of simulated rigorous drive testing conducted by TARDEC's Ground Vehicle Simulation Lab, actual drive testing at APG and additional ballistic testing at ARL, the redesigned armor kits were ready for deployment to Iraq. On Nov. 13, 2003, 15 new kits were shipped to Camp Anaconda where a TARDEC team began installation. Manufactured by TARDEC's Physical Prototyping Team, 85 more kits followed to destinations in Iraq and Kuwait.

Once thought to be only a temporary solution to threat issues in Iraq, Manceor said, "The TARDEC/ARL design is well-integrated into the vehicle, affordable and effective. The PM Light Tactical Vehicles decided that this kit will become standard stocked HMMWV hardware." As a result of

increased defense and Army funding, TARDEC engineers have handed off design plans for more than 6,000 kits to government fabricating facilities at Anniston Army Depot, AL; Rock Island Arsenal, IL; and Red River Army Depot, TX, for early 2004 production.

To provide more armor kits for Soldiers, ARL, TARDEC and the PM team have worked since September 2003 on a multipronged approach:

- Depot production will be supplemented by commercial armor solutions.
- Dedicated ATC testers are testing numerous commercial kits around the clock. The kits are being held to the same rigorous standards set by the ASK.
- The Army is close to selecting an industry partner to produce armor kits of their own design.

According to Steve Roberts, Assistant PM for HMMWV Armor Kits, "The driving factor is protection for the Soldier. The combination of depot and industry production allows for the maximum number of vehicles to be kitted in the shortest time possible. The cooperation of the acquisition, research and test community to quickly get Soldiers the required equipment has been truly outstanding."

"This is the way these things are supposed to work," commented TARDEC Executive Director for Development Thomas Mathes. "It was a total RDECOM and PM team experience for success." ARL developed a technology solution, TARDEC refined the design and integrated it into the vehicle, and the Tank-automotive and Armaments Command's Ground Systems Industrial Enterprise is now taking the resultant technical data package and making the kits in quantity. As Mathes points out, "The Army's most valuable resource is our people, who did what it took to get the Soldier what was required."

Judging from feedback received, Soldiers in the field agree, and as more armored convoys roll out of Anaconda, Soldiers comment that they feel much safer and, most important, that their concerns have been heard.

Paul D. Mehney is a Marketing Specialist with TARDEC's Operations Business Group.



TARDEC engineers install an ASK on a HMMWV at APG prior to field testing.

Arming Warfighters for Peacekeeping — Non-lethal Armaments

John Cline

Hajji's ice stand is a familiar sight to U.S. troops traveling along this main Baghdad artery. In the city's oppressive summer heat, the sight of Hajji hawking his small sacks of ice is a familiar one. But today is different and possibly dangerous. A passing Humvee containing American soldiers suddenly slows to avoid an Iraqi child playing in the road. Hajji leaves his roadside stand and approaches the soldiers, ice in hand. A few meters behind him, five men appear abruptly, moving quickly toward the vehicle as they shout something the soldiers do not understand in their native tongue. One carries a bag. A soldier yells "Stop!" His words have no effect. The moment is tense. Perhaps the men are friendly, he thinks to himself. But they also may be terrorists. The soldiers must make a split second judgment call on what action to take....

U.S. Soldiers in Iraq frequently face uncertainties similar to the scenario above. But lethal weapons no longer are the only military response to such potential threats. Soldiers on patrol in Iraq and other regions in which the U. S. maintains a military presence now have a veritable arsenal of lethal and non-lethal technologies from which to choose. Non-lethal weaponry has finally come of age.

The Army's lead organization for non-lethal technologies is the Army Materiel Command's Armament Research, Development and Engineering Center (ARDEC) located at Picatinny Arsenal, N.J. A non-lethal team of engineers and scientists there pays close attention to reports on the use of non-lethal options, even as it develops the next generation of munitions and weaponry.

When retired Army LTC Wesley "Bo" Barbour, a consultant who trains Soldiers how to use selected non-lethal munitions and devices, returned from Iraq earlier this year, the ARDEC non-lethal team invited him to visit. During this visit, Barbour noted that one Picatinny-managed non-lethal armament, urgently fielded at the start of *Operation Iraqi Freedom*, is used extensively by U.S. troops. The Advanced TASER, an electric, hand-held stun device that is in the hands of troops patrolling Baghdad, Tikrit, Mosul and other urban areas, is a favorite of Soldiers there, he said. Prisoner detainee centers also are using the devices with considerable

success, Barbour commented. The mere sight of the TASER, he was told, has an immediate, pacifying effect on detainees.

Barbour said that he trained more than 100 soldiers to use the TASER while in Iraq. Similar in appearance and touch to the M9 pistol, the weapon has an effective range of between 3-18 feet. It is laser-aimed, powered by compressed air cartridges and fires two tethered dart electrodes toward the target. The target experiences two distinct sensations when hit — extreme pain and instant muscle block. The latter effect has prevented a suicide bomber from detonating body explosives when hit, Barbour said, something a lethal weapon might have failed to do.

While civilian law enforcement agencies in the U.S. have used the TASER for some time, the military has not. At the urging of field commanders and with full backing of Army leaders, a team of Picatinny scientists and engineers began work on delivering an approved device to soldiers in April 2003. Their objective was to put the Advanced TASER in Soldiers' hands within 90 days. The device arrived in Iraq 87 days later.

The TASER team faced many challenges. Among them was the need to identify human safety standards. Local police departments, law enforcement agencies and the vendor had compiled some data. But the information they'd gathered was of little help to the Picatinny team. The non-lethal team set about determining safety parameters, operating restrictions and hazard warnings to ensure the weapon's effectiveness in the field.

Field commanders in Iraq report that the non-lethal stun device is a tremendous asset. It has minimized injuries to public crowds and helped control unruly individuals and groups. The device is preferred by Soldiers over various chemical compounds like pepper spray which have considerable limitations when used in high-temperature environments like Iraq.

The Advanced TASER is one of a growing number of non-lethal options designed to provide soldiers with a range of armament responses. During the past three years, Picatinny has urgently fielded sets of non-lethal items to Bosnia, Kosovo and Afghanistan. The items in these sets range from low-tech wooden batons, loudspeakers and full body shields to more sophisticated gear like infrared spotlights and 40 mm and 12 gauge point and area blunt-impact munitions. Five sets are now in Iraq, being used to conduct searches, secure perimeters, monitor prisoners and control crowds.

Supporters of non-lethal programs foresee U.S. Forces being equipped with an arsenal of next generation non-lethal weapons in the not-too-distant future. Outside the military, non-lethal alternatives continue to be a strong deterrent for use by domestic law enforcement officials. They also are vital to emerging Homeland Defense counterterrorism strategies.

The Picatinny team is working on a number of additional non-lethal devices. Among these are next-generation ground vehicle arresting barriers, area denial systems and non-lethal pre-emplaced munitions. In addition, they are researching the effects of a variety of non-lethal weapons and technologies on human physiology, cognition and behavior.

Lighter, flexible, high-strength materials and more portable systems are essential for critical applications at security checkpoints and perimeters that protect key physical assets. The Picatinny team also is developing alternate vehicle stopping methods that use electronic and directed energy approaches. Existing net and wire-like versions effectively disable vehicles by entangling wheels, but are cumbersome and heavy. They lack easy transportability and speed of assembly — features vital to a Future Force environment.

The non-lethal team also is developing future area denial systems. These counterambush devices — which can be deployed from armored vehicles — will neutralize off-road enemy forces, and better protect U.S. and allied logistics convoys. The Picatinny team currently is working on a non-lethal mortar projectile that will permit commanders to use indirect-fire systems to scatter large numbers of potentially hostile noncombatants in urban environments. Effective crowd control and disorientation devices that precisely aim sounds or obscure visibility are also under study.

Pre-emplaced non-lethal munitions exist but are not widely used by field commanders, perhaps because of a belief that the *Ottawa Treaty* outlaws them. New Non-Lethal Modular Crowd Control Munitions, variants of the old Claymore mine, deliver payloads of rubber balls intended to stun, not maim. Even lethal pre-emplaced munitions now have advanced designs allowing for “man-in-the-loop” control, ensuring area denial while permitting full human control and appropriate decommissioning. Reeducation around the flexibility of using these existing systems is desirable.

Researching the effects of various non-lethal weapons and technologies on human physiology, cognition and behavior is critical for device designers. The Picatinny team is pioneering deeper understanding through a new Target

Behavioral Response Laboratory. Working with a consortium of scientists from the military, medical community and academia, this unique one-of-a-kind lab is of strong interest to the military, the Department of Homeland Security and various law enforcement agencies. These sectors have expressed interest in using this soon-to-be expanded facility. By identifying performance metrics to track the response of individuals and groups to non-lethal stimuli, the lab will assist Picatinny weapons developers to gauge risk levels associated with nonconventional approaches.

Continuous Soldier feedback from Iraq and other theaters confirms the value of non-lethal munitions and devices. Soldiers acknowledge that having options short of using deadly force provides alternative means for controlling crowds without loss of innocent life and serious damage to physical structures — an especially important consideration in closely populated areas.

John Cline is ARDEC's System Manager for the Army's Non-Lethal Technology Integration. He is based at Picatinny Arsenal, NJ. He has a B.S. in mechanical engineering from Villanova University and an M.B.A. from Florida Tech.

Up Close and Personal — Iraqi Style

Picatinny Arsenal Public Affairs Office

Three visitors dressed in desert battle dress uniforms enter a bombed-out palace complex in Tikrit, Iraq. It's July 14, 2003. The palace is now occupied by U.S. troops. The trio approaches a small group of sand-encrusted soldiers who are cleaning their rifles. The visitors introduce themselves. Like the soldiers, they're Americans — two Army officers and one Army civilian.

The visitors have come to Iraq to find out how well the soldiers' weapons are holding up in the country's extreme conditions. They speak in hushed voices to avoid disturbing some soldiers who are sleeping nearby. The soldiers respond candidly to the visitors' questions. They discuss reliability, cleaning, ammunition, magazines, cases, lubricants and optical sights. The visitors listen intently, asking questions, examining rifles and taking copious notes. The 90-minute conversation passes quickly. When the interview is finished, the visitors thank the soldiers, wish them luck and head off to their next destination.

John Resch, the Army civilian, is a highly regarded weapons development engineer from the Armament Systems Integration Center, Program Integration Office for Mounted and Dis-mounted Lethality Systems, located at Picatinny Arsenal, NJ. He is an expert in small and medium caliber weapons design.

The full team consisted of Resch and Majors Mike Williams, Roy Manauis and Kevin Finch from Picatinny Arsenal and CPT Dave Fontaine from Fort Benning, GA. The trip was chartered by the Army's Project Manager for Soldier Weapons (PMSW), also located at Picatinny. PMSW is responsible for small arms development and procurement.

By the time the team left Iraq, another team just like it had spoken to more than 1,000 infantry and logistics support troops and collected 40 pages of handwritten notes along the way.

"We first arrived in the theater of operations June 9, 2003, at Kuwait's Camp Wolfe," Resch recalled. "The plane ride took 32 hours. The team's first stop was Camp Arifjan where it met with contacts, made logistical arrangements and laid out a plan for evaluating the reliability and performance of individual soldier weapons and ammunition under combat conditions," Resch continued.

"Over the next 30 days, we visited Camps New Jersey and New York in Kuwait and the cities of Tikrit, Mosul, Erbil and Baghdad, as well as a side visit to Afghanistan," Resch commented. "We traveled throughout Iraq and Kuwait interviewing infantrymen, tankers, snipers and military police. We passed dozens of Iraqis, some with enthusiastic smiles and waving hands, others with grim stares that clearly stated that Americans are unwelcome," he recalled.

Resch said that the visitors quickly realized how valuable items like water and sunglasses were in the desert environment. "We had to travel in convoys," he said. "As we moved, we scanned the horizon looking for dust devils — small tornado-like wind swirls that can instantly blind drivers."

"The ever-present danger of mortar and rocket propelled grenade attacks forced the team to roar through intersections, ignore occasional traffic signals and cast their wary eyes upward at any overpass," he said.

On a Monday morning several weeks later, Resch and Finch met in a Picatinny conference room with 30 fellow technologists and project officers who'd gathered to listen to them relate their experiences. Aided by photographs and slides, hardware samples and statistical charts, the two enthusiastically

shared their lessons-learned with an attentive group of their peers. The session represented an important process in the crucial feedback loop from front-line soldier to the weapons design community.

"Weapons developers often tap the data flow found in electronically published 'lessons learned' that forward-deployed commanders compile and distribute widely throughout the military," Resch explained. "Valuable as this data is, it is necessary to dig deeper in an effort to discover even more important tacit knowledge that may lie between-the-lines," Resch intoned.

Picatinny's network of personal and military contacts allows Army weapons developers to dig deeper into weapons systems performance and identify shortfalls in performance in urban and desert environments. The team's visit to Kuwait and Iraq yielded some valuable lessons. "Among these is the realization the soldiers want to talk," Resch continued. U.S. troops were happy to sit and talk with the stateside visitors about their rifles, their pre-Iraq training and even how much they missed their loved ones."

Resch said the team also found that front-line inventiveness is alive and well. The team saw first-hand how soldiers had found a way to remove ammunition from their vest pockets while lying prone in sand. Troops cut the vests in half and strapped each half to a leg.

"The soldiers we interviewed told us that the M4 and M16 weapons functioned as designed," Resch remarked. "Field research found that the use of different types of lubricant did little to prevent weapon jamming. According to the soldiers we interviewed, regular, disciplined cleaning was the only way to avoid jamming problems."

Resch also said that troops reported that ammunition magazines sometimes did not properly feed rounds into their weapons. The team observed that soldiers were hoarding old magazines, reluctant to turn them in when issued new ones. The spring mechanisms in some of the older magazines no longer exerted the force required to push a round into the firing chamber. This caused some weapons to jam.

"Soldiers said that optical sights gave them greater confidence when acquiring and engaging targets," Resch explained. "The team also discovered that the supply of non-lethal ammunition exceeded demand, and some nonlethal items like sponge grenades sometimes degraded in Iraq's high temperatures."

"The team's visit to Kuwait and Iraq was invaluable," Resch reflected. "It yielded a considerable amount of important information for our weapon developers. In addition, the visit was a significant public relations initiative that let U.S. soldiers know that weapon designers are keenly interested in what they think and what they have to say," Resch concluded.

UAV Work Means Kudos for Yuma Proving Ground

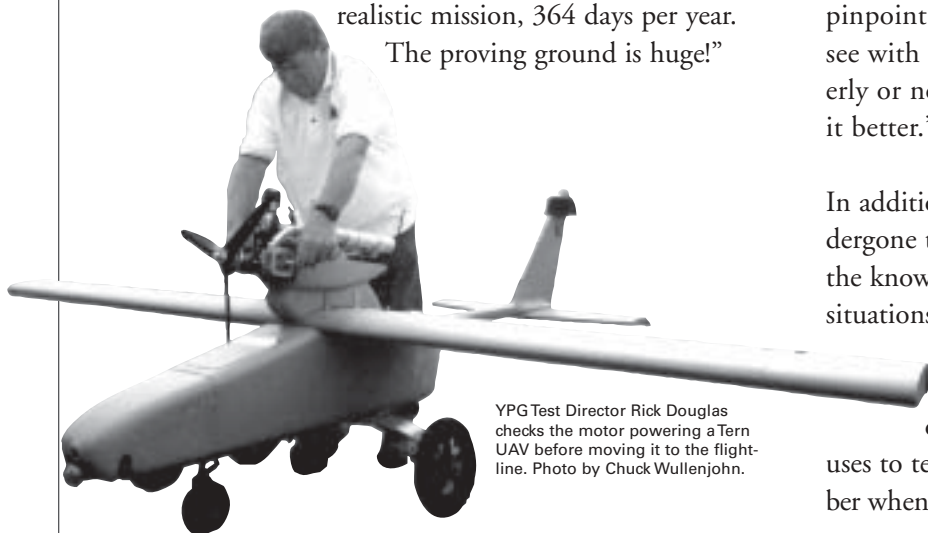
Chuck Wullenjohn

The fog of war is made even worse when sand is kicked up during military operations in the rugged deserts of Iraq and Afghanistan. This makes testing and training activities at U.S. Army Yuma Proving Ground (YPG), AZ, more important today than ever before. YPG's 1,200 square miles of harsh terrain, located in America's hottest and driest desert, is proving to be an ideal place for testing equipment and training Soldiers for duty in Southwest Asia.

Rick Douglas, YPG's Test Director for the last 25 years, is an aviation test expert who spends his time working with unmanned aerial vehicles (UAVs). Though testing of munitions and weapon systems makes up 75 percent of YPG's overall workload, test activities involving UAVs are growing and have snowballed in the last year.

"We offer UAV customers capabilities they can't get anywhere else," said Douglas. "We have an unbelievably large test range, varying terrain, restricted airspace that we own, large firing areas and no urban encroachment. Literally, a customer can fly a UAV on a 250- to 300-mile thoroughly realistic mission, 364 days per year.

The proving ground is huge!"



YPG Test Director Rick Douglas checks the motor powering a Tern UAV before moving it to the flight line. Photo by Chuck Wullenjohn.

For the past year, Douglas and a team of UAV and aviation test experts have worked closely with the Deputy Under Secretary of Defense (Advanced Systems & Concepts) to test various types and configurations of UAVs and train teams of military personnel. Dozens of UAVs have been tested, from the hand-held Evolution (formerly known as Snake Eye) and Pointer UAVs, to the much larger Pioneer. Other UAVs tested at YPG include the Tern, Mako and Hawkeye. Some are launched from helicopters and fixed-wing cargo aircraft. Douglas estimates more than 50 variants of UAVs and sensor systems have come to YPG over the past year, with 75 percent being deployed directly to the Persian Gulf.

YPG UAV testing most often involves expendable UAVs that are generally low-cost platforms. Expendable UAVs are generally used for surveillance roles and for perimeter watch. Depending on the specific type of UAV, loitering times range from 90 minutes to more than 16 hours.

A variety of resupply pods have been developed at YPG for mounting to UAV undercarriages for resupplying friendly forces. These pods can carry a variety of items, including medical supplies, food and ammunition. The UAV itself is controlled by a global positioning system. All an operator needs to do is enter the coordinates of where the UAV is to fly and the coordinates for where the cargo is to be dropped. UAVs can drop sensors for surveillance and can even be used as armed weapon delivery systems.

YPG's firing ranges make it a particularly appropriate location for UAV testing. "There is much more to YPG than simply earth and air," said Douglas. "It's the telemetry and technical infrastructure we have that proves invaluable. This includes Kineto Tracking Mounts, high-speed video, radar, telemetry and detailed, real-time data transmission and mission control that allows testers to gather accurate, pinpoint data. This real-time data enables customers to see with high accuracy why a system is performing properly or not, then pinpoint what needs to be done to make it better."

In addition to testing, dozens of military personnel have undergone training with UAVs over the past year to give them the knowledge and real-world experience needed in combat situations in Afghanistan and Iraq.

"We are the only location that Alexander Lovett of the Office of the Secretary of Defense (OSD) uses to test expendable UAVs," explained Douglas. "I remember when he showed up at 7:00 one morning a year ago —

we began testing by noon. He had real-world requirements that needed to be carried out quickly, so we adapted to meet them. Customer focus and flexibility like this is a hallmark of what we do.”

In addition to YPG’s large size and restricted airspace, facilities have been constructed specifically aimed at meeting UAV test needs. Several asphalt runways have been built, totaling 7,000 feet in length. Planning is underway to expand and build new office and maintenance facilities to meet the increased workload and future testing requirements.

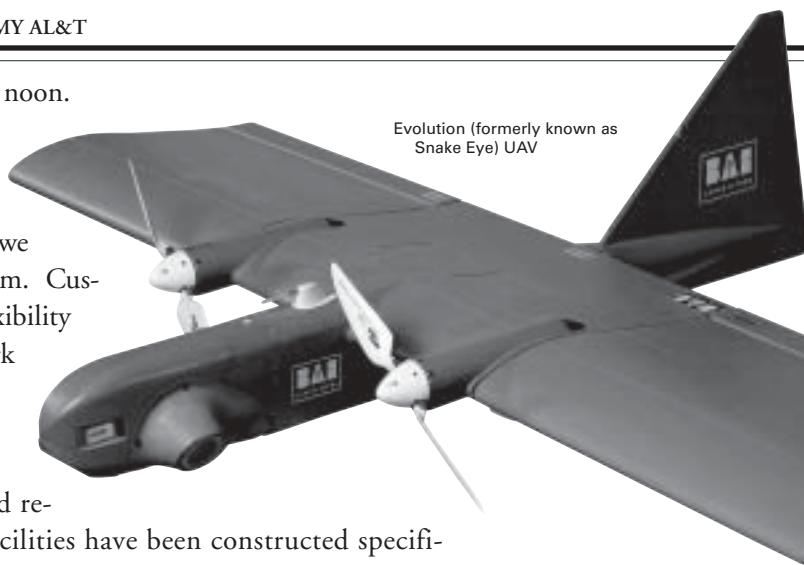
YPG maintains an extensive collection of former Soviet armored vehicles, from T-72 Main Battle Tanks to BMP Armored Personnel Carriers. The vehicles are frequently used during UAV tests to act as electronic targets to simulate realistic battlefield threats. Other targets of a more specialized nature have also been constructed with an eye toward accuracy and realism to ensure testing and training activities are as relevant as possible.

Douglas feels the UAV targets available at YPG are a unique national resource. “We don’t just simulate enemy threats here — we have the real thing,” he said. “American forces in Afghanistan and Iraq have reported seeing these exact same threat vehicles. I feel this makes our training and testing priceless.”

According to Douglas, one of YPG’s most valuable features is the vast amount of restricted airspace available to testers. YPG’s 1,200 square miles is divided into two ranges — the east-west Kofa Firing Range used mostly for artillery testing, and the north-south Cibola Range used for aircraft and parachute training and testing. YPG owns the vertical airspace above the Kofa Firing Range from the surface up to an unlimited number of feet and on the Cibola Range from the surface to 80,000 feet. The airspace over the adjacent 665,000-acre Kofa Wildlife Refuge is also controlled by YPG, offering additional airspace to testers.

Douglas is quick to point out that YPG — not the Federal Aviation Administration (FAA) — owns the airspace.

Evolution (formerly known as Snake Eye) UAV



This means proving ground officials manage the airspace with testing and training needs in mind and offer it up to the FAA only when not needed. At many other military testing locations, airspace is not directly controlled by installation officials, but by the FAA.

Douglas and fellow team members Jerry Crump and Rick Slaughter were recently honored by OSD for their critical involvement in UAV testing and training operations in support of *Operations Enduring Freedom* and *Iraqi Freedom*. Their work resulted in significantly improved military capabilities and helped save Soldier lives.

“Our job is to make equipment better, and we’re proud to do it,” said Douglas, a Vietnam War veteran. “It’s gratifying to know much of the equipment we test is deployed overseas right away and we’ve received confirmation of the value of what we do. It’s great to support our fighting forces and save American lives at the same time.”

Slaughter, an engineer technician, came to YPG in 1998 and works closely with Douglas as a member of the UAV test team. He takes great pride in the work he does.

“Much of the equipment we’ve worked on is now in service in Iraq,” Slaughter remarked. “We’ve helped make the troops safer and that’s an outstanding feeling. Sometimes it feels like we spend more time at the proving ground than we do at home, but we definitely are a team and all of us have become good friends.”

Though three people were presented with the OSD award, hundreds of people have worked to ensure the success of UAV testing and training at YPG, cutting across the proving ground’s 1,700-person workforce. It’s a mission that will continue to grow because YPG’s mammoth size and excellent facilities make it a one-of-a-kind national defense asset.

Chuck Wullenjohn is the YPG Public Affairs Officer.